



(11) **EP 3 655 075 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
29.12.2021 Bulletin 2021/52

(51) Int Cl.:
A61M 11/06 ^(2006.01) **A61M 11/00** ^(2006.01)
A61M 16/20 ^(2006.01) **A61M 11/02** ^(2006.01)

(21) Application number: **18739559.5**

(86) International application number:
PCT/EP2018/069492

(22) Date of filing: **18.07.2018**

(87) International publication number:
WO 2019/016257 (24.01.2019 Gazette 2019/04)

(54) **NEBULIZATION DEVICE FOR MEDICAL MIXTURE**

ZERSTÄUBUNGSVORRICHTUNG FÜR MEDIZINISCHES GEMISCH

DISPOSITIF DE NÉBULISATION POUR MÉLANGE MÉDICAL

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

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(30) Priority: **19.07.2017 IT 201700082273**

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(43) Date of publication of application:
27.05.2020 Bulletin 2020/22

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Description

Field of application

[0001] The present invention relates to a portable nebulization device for medical fluids, and in particular to a universal nebulization device, optimized for the treatment of all of the tracts of a patient's respiratory system.

[0002] The above nebulization apparatus finds useful application in the medical field, particularly in the aerosol therapy field.

Prior art

[0003] The administration of drugs by air tract through appropriate nebulizing devices is a therapeutic practice usually employed in relation to numerous diseases, especially of the respiratory apparatus.

[0004] In particular, nebulization allows dividing a drug in the liquid form into a plurality of very fine particles, having a diameter of a few micrometers, which can be easily inhaled by a patient.

[0005] It is also known that for the treatment of the various tracts of the respiratory system a specific nebulization is necessary.

[0006] Indeed, in order for the nebulized particles to be able to reach differently the upper respiratory tract, the tracheo-bronchial tract or the pulmonary alveoli a different sizing is needed.

[0007] In fact, for a treatment involving the first respiratory tract a coarser nebulization is recommended, whereas for the deeper respiratory tracts a very fine nebulization is essential.

[0008] The optimal granulometry for the treatment of the specific respiratory tracts is indicated in the bibliography and in the specific UNI EN 13544-1 standard, which specifies that:

- a diameter greater than 5 μm allows a deposition in the upper respiratory tract;
- a diameter comprised between 2 μm and 6 μm allows a deposition in the tracheo-bronchial tract;
- a diameter comprised between 0.5 μm and 3 μm allows a deposition at the level of the pulmonary alveoli.

[0009] In order to obtain a granulometry suitable for the various needs above listed, the most adopted solution has been that of using specific components for each purpose.

[0010] In particular, within a known configuration of a nebulization device, more atomizers have been provided, from which pressurized gas is introduced (also called "pisper").

[0011] According to the adopted atomizer, there is indeed a more or less fine nebulization of the medical liquid.

[0012] This type of solution allows obtaining the undoubted advantage of providing precise dimensional at-

omization values for all needs.

[0013] However, it is equally clear that this solution also implies the drawback of being more difficult to be used.

[0014] In fact, it is necessary for the patient to have a minimum competence in choosing the correct atomizer in own specific case. This clearly involves the inherent risk of an incorrect choice of the atomizer.

[0015] To this drawback those of lack of practicality due to the need for replacement and to keep a greater quantity of components of the nebulization device with the risk of loss when not used are added.

[0016] For this reason, devices allowing a geometric positioning variation of the same components to obtain a different nebulization have also been provided.

[0017] For instance, European patent application n° EP 2 952 219A1 to 3A Health Care S.r.l. provides for a displacement of the air intake duct within the nebulization device, in order to vary the relative position thereof with respect to the atomizer from which pressurized gas is introduced.

[0018] Although this solution allows an advantage for the different nebulization obtained based on the relative position between the two above mentioned components, it also has drawbacks from an operation point of view.

[0019] In fact, due to the structural complexity, it does not allow a correct disassembling among the nebulization device components and a consequent inadequate cleaning/ disinfection/ sterilization.

[0020] In fact, we wish to recall that, since the nebulization devices are used for patients suffering from lung infections, all the components adopted must ensure a certain level of sterilization, so as not to further worsen said infection.

[0021] Another known technical solution is disclosed in US patent application n° US 3,658,059 A, which relates to an inhaler provided with a diaphragm to change the effective size of the passage suitable for making the suspension to be inhaled pass. The diaphragm is moved towards and away from the inhaler jet, in order to increase or reduce the opening. Though advantageous under various aspects, this solution does not allow a simple disassembling of the components to favour the cleaning and sterilization thereof.

[0022] A further known solution is described in European patent application n° EP 3 017 839 A1, which relates to a device for aerosol nebulizing substances with a separation element configured to divide the nebulization chamber into at least two sectors and with means for moving the separation element and adjusting the flow rate exiting from the device. This solution as well is not effective from the point of view of simplicity and ease of use in adjusting the nebulization level of the medicament by the user.

[0023] An object of the present invention is to provide a nebulization device that allows obtaining a different granulometry of the particles according to the needs of the specific patient, without replacing the components.

[0024] A further object is to provide the total disassem-

bling of the nebulization device to allow the correct cleaning/disinfection/sterilization of the adopted components.

[0025] Another object is to provide a nebulization device of practical use, even by not particularly experienced patients.

[0026] Finally, a further object is to provide a nebulization device that is structurally simple so as to avoid constructive problems which are not suitable for a product intended for mass production.

Summary of the invention

[0027] The solution idea underlying the present invention is to provide a nebulization device that allows the intake of air from outside in different quantities according to the needed granulometry to obtain.

[0028] The above technical problem is solved by a nebulization device for medical mixture, of the type comprising a containing ampoule for the medical mixture, at least one atomizer for the intake of pressurized gas within said ampoule, at least one emission opening of said nebulized medical mixture and at least one window for the intake of air from outside. The atomizer is surmounted by an upper portion of the ampoule. At least one, preferably two selection side windows are further provided on the wall of the upper portion of the ampoule, whose opening is shielded by shielding means. Said shielding means are axially moved, precisely allowing the shielding, by a command shaft thereto connected and by a shielding selector coupled and linked to a control knob connected to said command shaft such to control the flow coming from the atomizer; the coupling between said control shaft and said shielding selector being obtained by a threaded coupling.

[0029] According to a preferred embodiment, the shielding means are comprised in a skirt-shaped shielding selector which the shaft is connected to.

[0030] Furthermore, according to a preferred embodiment, the command shaft extends along the central axis of the duct.

[0031] According to another aspect of the invention, the shielding means consist in at least two bulkheads which extend parallel to the command shaft at the selection side windows.

[0032] According to another aspect of the invention, the nebulization device further comprises a control knob at an end of the command shaft in order to vary the position along the axis of the shaft itself through a rotary-translational movement.

[0033] According to a further aspect of the invention, the rotary-translational movement of said control knob that moves the command shaft is obtained through a cam groove obtained on an inner wall of the ampoule within which the control knob moves.

[0034] Alternatively, according to another embodiment of the invention, a wide-radius external thread is provided on the outer surface of the command shaft, external thread that engages with a corresponding inner thread

of a threaded portion of the shielding selector.

[0035] According to a second embodiment of the present invention, the shielding selector comprises two additional entry windows for the intake of air within said ampoule.

[0036] According to a further aspect of the invention, the nebulization device further comprises at least two valves at a base of said control knob for the variation of air flow into the inhalation and exhalation phases.

[0037] Still according to another aspect of the present invention, the nebulization device provides a mouthpiece at the emission outlet for the connection with the patient's air tracts.

[0038] Furthermore, according to an aspect of the invention, the ampoule is made of two pieces interconnected to each other.

[0039] Further features and advantages will become clearer from the following detailed description of a preferred, but not exclusive, embodiment of the present invention, with reference to the appended figures given by way of non-limiting example.

Brief description of the drawings

[0040] In said drawings:

- Figure 1 represents an exploded view of an embodiment of the nebulization device according to the invention;
- Figures 2a, 2b and 2c represent sectional views of the three operating positions of the nebulization device of figure 1;
- Figures 3a, 3b, 3c and 3d represent sectional views of the valve system and of the nozzle of the nebulization device of figure 1;
- Figure 4 represents an exploded view of a second embodiment of the nebulization device according to the invention;
- Figures 5a, 5b and 5c represent sectional views of the three operating positions of the nebulization device of figure 4;
- Figures 6a, 6b, 6c and 6d represent sectional views of the valve system and of the nozzle of the nebulization device of figure 1;
- Figures 7a and 7b show the sectional views of a third embodiment of a nebulization device according to the invention;
- Figures 8a, 8b and 8c show an exploded view of a fourth embodiment of a nebulization device according to the invention;
- Figures 9a, 9b and 9c show an exploded view of a variant of the embodiment of Figures 8a, 8b and 8c.

Detailed description

[0041] With reference to the figures, and particularly to figure 1, reference number 1 globally and schematically indicates a nebulization device realized according

to the present invention.

[0042] Said nebulization device 1 is illustrated in the Figures arranged vertically, according to a preferred operating configuration. In the following of the present invention, the positions and orientations, relative and absolute, of the various elements which the device is made of, defined by means of terms such as upper and lower, on and under, horizontal and vertical or other equivalent terms, will be expressed with reference to said configuration without them representing a limitation of the Applicant's rights.

[0043] The nebulization device 1 comprises an ampoule 2, preferably divided into two components, an upper component 2a and a lower component 2b, respectively.

[0044] The upper component 2a is preferably shaped as a circular section with an upper portion 3, having a larger diameter, and a lower portion 4, having a smaller diameter, which are connected to each other by a truncated-conical portion 5.

[0045] The lower component 2b preferably is also shaped as a circular section. Said lower component 2b preferably has an ergonomic profile externally, which facilitates the grip by the patient during the therapy. The lower component 2b further has an open end 6 within which the coupling with the upper component 2a occurs.

[0046] Preferably, at a side surface 10 of the component 2b, there is an opening 11 from which a duct segment 12 departs, which is preferably inclined by an angle with respect to a cross-section of the lower component 2b.

[0047] The duct segment 12 is shaped so as to couple to a connection device with the patient's air tracts, such as, for instance, a mouthpiece 13.

[0048] Nothing forbids adopting other connection devices with the patient's air tracts, such as the known nasal masks or forks.

[0049] At an end 7 opposite the open end 6, there is a closing surface 8, which is glass-shaped and comprising a nozzle-duct 9.

[0050] On the nozzle-duct 9 an atomizer 14 (also known in the art with the name of "pisper") is fitted.

[0051] Said atomizer 14 is surmounted by the lower portion 4 of the upper component 2a.

[0052] Between such a lower portion 4 and the atomizer 14 a shielding selector 15, which is preferably skirt-shaped, comprising at least one, preferably two, shielding means 16, is interposed. Said shielding means preferably consist in two bulkheads that develop parallel according to the longitudinal development of the ampoule 2. Furthermore, said shielding means 16 are preferably circumference-arc shaped.

[0053] Differently from the prior art, the invention does not provide any movement of the duct for the intake of air within the nebulization device to vary the relative position thereof with respect to the atomizer from which the intake of pressurized gas occurs, but just a relative movement of the shielding means 16 with respect to the atom-

izer 14.

[0054] The shielding means 16, according to the position along the axis, can control the flow coming from the atomizer 14. The shielding selector 15 is connected at an end 32 of the command shaft 17 which controls the movement thereof.

[0055] The command shaft 17, preferably provided along the longitudinal transversal axis of the ampoule 2, slides longitudinally, precisely moving the shielding selector 15.

[0056] At the opposite end 33 of the command shaft 17 and connected thereto a control knob 18 is preferably provided.

[0057] It is possible to provide for the control knob 18 to be integrally formed with the command shaft 17.

[0058] The shielding selector 15 is coupled and linked to the control knob 18 connected to said command shaft 17; the coupling between said command shaft 17 and said shielding selector 15 being obtained by a threaded coupling; for instance, a worm screw coupling.

[0059] The control knob 18 has a circular section, with a gripping portion 29 along a diameter thereof, ergonomically shaped to facilitate the rotation of the control knob 18.

[0060] The control knob 18, at the sides of the gripping portion 29, is crossed by at least one, preferably two entry windows 19, through which there is the intake of external air within the ampoule 2.

[0061] The control knob 18 provides a cam groove 21 on the outer surface 20.

[0062] The cam groove 21 is engaged by corresponding engaging pins 22 arranged at an inner surface 23 of the upper portion 3 of the upper component 2a.

[0063] At the lower portion 4 of the upper component 2a, at least one, preferably two, selection side windows 24 are obtained. Below said selection side windows 24 there is a lower portion sector 4 having height H. The two windows 24 are preferably provided on diametrically opposite parts.

[0064] Said selection side windows 24 can be totally, partially or not at all obstructed by the shielding means 16, as it can be seen in figures 2a, 2b and 2c, respectively.

[0065] Immediately contiguous to the control knob 18, at the entry windows 19, a valve system 25 is provided.

[0066] The valve system can be more evident in figures 3a, 3b and 3c.

[0067] The valve system 25 works synergistically with a valve 26 present on the mouthpiece 13.

[0068] In particular, in Figures 3b and 3c respectively, the closing and opening conditions of the valve system 25 are represented.

[0069] The valve system 25 of the present embodiment comprises two valves which open in the inhalation phase. In this phase, on the contrary, the closing of the valve 26 arranged on the mouthpiece 13 occurs. Vice versa, in the exhalation phase the closing of the valves of the valve system 25 and the opening of the valve 26 on the mouthpiece 13 occur.

[0070] Instead, in Figure 3d an enlarged section of the functional coupling between the nozzle duct 9, the atomizer 14 and the shielding selector 15 is highlighted.

[0071] In Figure 4 a second embodiment of the present invention is represented.

[0072] Said embodiment differs from the embodiment represented in Figure 1 in the presence of two additional entry windows 27 on the shielding selector 15, close to the coupling with the command shaft 17.

[0073] Another difference of this embodiment with respect to the embodiment of Figure 1 is represented by the absence of the truncated-conical portion 5 between the upper portion 3 and the lower portion 4 of the upper component 2a of the ampoule 2. Instead of this truncated-conical portion 5, an immediate reduction in section between the upper portion 3 and the lower portion 4 is provided at a cross-section 28.

[0074] The lower portion 4 of the upper component 2a of the ampoule 2 is therefore longer with respect to the first embodiment of the invention.

[0075] A further difference of this embodiment with respect to the one represented in Figure 1 is represented by the valve system 25. In fact, instead of the two valves of the first embodiment, a unique baffle 30 is provided.

[0076] It is possible to see in detail the different valve system of the second embodiment in Figures 6a, 6b and 6c.

[0077] The baffle 30 operates analogously to the valves of the first embodiment. In fact, a deformation thereof inwards allows the air flow in the inhalation phase, when the corresponding valve 26 on the mouthpiece 13 is closed. Instead, in the exhalation phase the baffle 30 returns to a rectilinear conformation, thus occluding the entry windows 19, whereas the opening of the valve 26 occurs on the mouthpiece 13.

[0078] Instead, in Figure 6d an enlarged section of the functional coupling between the nozzle duct 9, the atomizer 14 and the shielding selector 15 is highlighted.

[0079] Since the valve system 25 is particularly complex and, consequently expensive, a third embodiment represented in Figures 7a and 7b is provided.

[0080] In said Figures it can be noticed that the valve system is replaced by a virtual valve system 37. Said virtual valve system 37 is obtained through a different conformation of the entry windows 19. In fact, instead of housing valves, such entry windows 19 have a "wolf-mouth" section, which is sufficient to ensure the correct delivery of the nebulized and meanwhile to properly obstruct the discharge of the flow exhaled by the patient. In this way said exhaled flow is free to vent through the side windows of the mouthpiece, which is also devoid of a valve.

[0081] A fourth embodiment is also provided, which is realized as an alternative adjustment mode through the shielding selector 15.

[0082] According to said embodiment, the shielding selector 15 is provided with a threaded portion 34 protruding upwards, which is provided with an inner thread

35, which is at least a single-start-thread.

[0083] Said inner thread 35 is engaged by at least one wide-radius external thread 36 obtained on an external surface 38 of the command shaft 17.

5 **[0084]** As a result, the above-mentioned adjustment of the shielding selector 15 is obtained through a rotary movement of the command shaft 17 within the threaded portion 34 of the shielding selector 15 itself.

[0085] Therefore, engaging pins 22 sliding in a cam groove 21 of the control knob 18 are not provided.

10 **[0086]** Said solution allows reducing the size in height both of the control knob 18 and of the upper part 2a, thus making the ampoule 2 more compact.

[0087] Nothing forbids using a threaded coupling with a multiple-start thread 36 as represented in Figures 9a, 9b and 9c instead of a wide-radius external thread 36 with an almost similar operation.

[0088] In said Figures a lower portion sector 4' is further shown, below the selection side windows 24, having height H1, which is greater than the dimension H present in the described embodiments. Said dimension variation allows both strengthening such a sector and obtaining a better selection of the size of the particles, which can have more reduced size.

20 **[0089]** Furthermore, in Figure 9c an enlarged sectional view of a protuberance 39 on the lower portion sector 4' close to the upper portion 3 is also visible. Said protuberance 39, as visible, houses locking wings 40 adapted to block the rotation of the command shaft 17 within the threaded portion 34 of the shielding selector 15 once the desired shielding position has been reached.

25 **[0090]** In the following the operation of the nebulization device 1 according to the invention will be described, considering, for illustrative purpose, the above described embodiments.

30 **[0091]** In particular, reference is made to Figures 2a, 2b and 2c for the first embodiment and to Figures 5a, 5b and 5c for the second embodiment.

[0092] Once the ampoule 2 of the nebulization device 1 has been filled in with medical fluid and assembled, the operation of the components also present in the prior art does not result to be varied.

[0093] Therefore, the intake of pressurized gas through the nozzle duct 9 and the atomizer 14 occurs.

40 **[0094]** Simultaneously, through the entry windows 19 the intake of external air within the ampoule 2 occurs.

[0095] Therefore, the nebulization of the medical fluid occurs, which is inhaled by the patient through the mouthpiece 13 connected to the emission duct 12.

50 **[0096]** According to the invention, through the command shaft 17, the shielding selector 15 and the selection side windows 24 the required granulometry can be obtained.

55 **[0097]** Through the rotation of the control knob 18 and the consequent sliding of the engaging pins 22 within the cam groove 21, there occurs a rotary-translational movement of the control knob and jointly of the command shaft 17.

[0098] Thus, the movement of the shielding selector 15 and of the shielding means 16 is thus allowed.

[0099] As seen, the present embodiments provide three selection positions, to each of which the correct granulometry for the respiratory tract affected by the specific patient's therapy corresponds.

[0100] This does not exclude that it is possible to provide a greater number of positions to specify even more a tract to which a therapy can be addressed, without departing from the object of the present invention defined by the appended claims.

[0101] The three illustrated selection positions correspond, in this case, to:

- position 1, as illustrated in Figures 2a, 5a: a total opening of the selection side windows 24 by the shielding means 16 of the shielding selector 15;
- position 2, as illustrated in Figures 2b, 5b: a partial opening of the selection side windows 24 by the shielding means 16 of the shielding selector 15;
- position 3, as illustrated in Figures 2c, 5c: a total occlusion of the selection side windows 24 by the shielding means 16 of the shielding selector 15.

[0102] In this way, there are obtained, respectively:

- large particles for the treatment of the upper respiratory tracts;
- particles suitable for the tracheo-bronchial tract treatment;
- fine particles for the treatment of pulmonary alveoli.

[0103] In particular, experiments performed by the Applicant have shown that the ampoule 2, according to the configuration, allows obtaining a dimensional difference of MMAD (Mass Median Aerodynamic Diameter) of the particles which varies:

- by about 30 - 50% between position 1 and position 2, and
- by about 150 - 200% between position 1 and position 3.

[0104] Surely, the delivery speeds also differ markedly, indicatively by the same variation value cited for the dimensions of the particles.

[0105] Using the second embodiment illustrated in Figure 4 and previously described, through the use of the additional entry windows 27 on the shielding selector 15, the flow area for the air entering the ampoule 2 is varied.

[0106] Clearly, the greater or smaller dimension of the flow area and therefore the greater or lesser consistency of the air flow affects both the delivery speed and the size of the aerosol particles generated by the ampoule 2.

[0107] Furthermore, in the second embodiment illustrated in Figure 4, the replacement of the truncated-conical portion 5 instead of a sharp reduction in diameter between the upper portion 3 and the lower portion 4 of

the upper component 2a may also affect the performance of the ampoule 2.

[0108] Advantageously, the described nebulization device allows the formation of a medical aerosol having different granulometries. In this way the nebulization device 1 according to the invention allows being universally optimized for all the required therapies, whether they are directed to the upper respiratory tracts, to the tracheo-bronchial tract, or more internally to the pulmonary alveoli.

[0109] Further advantageously, this can be simply obtained by rotating a control knob 18 by a predetermined quantity, thus reaching the correct level of shielding of the flow exiting from the atomizer 14.

[0110] Furthermore, advantageously, the nebulization device 1 is completely disassemblable. Therefore, the practicality of the cleaning, disinfection and sterilization phases of the nebulization device 1 components is improved. In fact, with respect to the prior art, embedded, hidden or difficult to reach components are not present, as above described. In this way the hygiene required for a medical device and the prevention of the proliferation of germs, bacteria and viruses are ensured.

[0111] Still advantageously, the disassemblability feature is inherently connected to the substitutability feature. It is in fact possible, in case of malfunction or damage to one of the components, to only replace the malfunctioning or damaged component.

[0112] A skilled person will also understand how the nebulization device 1 according to the invention is practical to use by any patient, without the possibility to incur errors which could make the therapy ineffective.

[0113] Still advantageously, the components of the nebulization device 1 are made of materials suitable for the purpose, both in terms of nebulization and in terms of strength, easy availability and lastly, they are not overly expensive.

[0114] The skilled person will understand that the embodiment described can be subjected to various changes and variations, according to specific and contingent needs, all included within the scope of protection of the invention, as defined by the following claims.

45 Claims

1. Nebulization device (1) for medical mixture, of the type comprising

a containing ampoule (2) for said medical mixture, comprising an upper component (2a) and a lower component (2b) connected to each other;

at least one emission opening (11) of said nebulized medical mixture from said ampoule (2), and

at least one entry window (19) for the intake of air within said ampoule (2);

- at least one atomizer (14) for the intake of pressurized gas, within said lower component (2b) of said ampoule (2), said atomizer (14) being surmounted by said upper component (2a)
- at least one, preferably two selection side windows (24) on said upper component (2a), an opening of said selection side windows (24) being shielded by shielding means (16), moved by a command shaft (17)
- characterized in that** said shielding means (16) are axially moved by said command shaft (17) through a shielding selector (15) coupled and linked to a control knob (18) connected to said command shaft (17) such to control the flow coming from the atomizer (14); the coupling between said command shaft (17) and said shielding selector (15) being obtained by a threaded coupling.
2. Nebulization device, according to claim 1, wherein said command shaft (17) is connected at one end (32) of a skirt shaped shielding selector (15) comprising said shielding means (16).
 3. Nebulization device, according to claim 1 or 2, wherein said command shaft (17) extends along a central axis of said upper component (2a).
 4. Nebulization device, according to any one of claims 1 to 3, wherein said shielding means (16) consists in at least two bulkheads which develop parallel to a longitudinal development of said ampoule (2), at said selection side windows (24).
 5. Nebulization device, according to any one of claims 1 to 4, wherein said shielding selector (15) further comprises two additional entry windows (27) for the intake of air within said ampoule (2).
 6. Nebulization device, according to any one of claims 1 to 5, wherein said control knob (18) placed at one end (33) of said command shaft opposite to said shielding selector (15), varies a vertical position of said command shaft (17) through a rotary-translational movement.
 7. Nebulization device, according to any one of claims 1 to 6, wherein said control knob (18) provides a cam groove (21) at an outer surface (20) thereof, which can be coupled to corresponding engaging pins (22) at an inner surface (23) of said upper component (2a).
 8. Nebulization device, according to any one of claims 1 to 7, further comprising at least one valve system (25) at a base of said control knob (18) for a flow variation of air flow into the inhalation and exhalation

phases.

9. Nebulization device, according to any one of claims 1 to 7, **characterized by** providing a virtual valve system (37) wherein said at least one entry window (19) is wolf-mouth-shaped for adjusting the air flow entering and exiting from said ampoule (2) into the inhalation and exhalation phases.
10. Nebulization device, according to any one of claims 1 to 7 wherein said shielding selector (15) is provided with a threaded portion (34) protruding upward, provided of an inner thread (35), such inner thread (35) being engaged by at least one wide-radius external thread (36) obtained on an external surface (38) of said command shaft (17), to shield the opening of said selection side windows (24).
11. Nebulization device, according to any one of claims 1 to 9, further comprising a duct segment (12) for the coupling with a mouthpiece (13) at said at least one emission opening (11).
12. Nebulization device, according to claim 10 further comprising rotation locking wings (40) for said command shaft (17) within said threaded portion (34).

Patentansprüche

1. Zerstäubungsvorrichtung (1) für ein medizinisches Gemisch, umfassend
 - eine Behälterampulle (2) für das medizinische Gemisch, umfassend eine obere Komponente (2a) und eine untere Komponente (2b), welche miteinander verbunden sind;
 - zumindest eine Emissionsöffnung (11) des zerstäubten Gemischs der Ampulle (2), und
 - zumindest ein Eintrittsfenster (19) für die Aufnahme von Luft innerhalb der Ampulle (2);
 - zumindest einen Zerstäuber (14) für die Aufnahme von unter Druck stehendem Gas innerhalb der unteren Komponente (2b) der Ampulle (2), wobei der Zerstäuber (14) von der oberen Komponente (2a) überstiegen ist;
 - zumindest ein, bevorzugt zwei Auswahlseitenfenster (24) auf der oberen Komponente (2a), wobei eine Öffnung der Auswahlseitenfenster (24) mittels eines durch eine Steuerwelle (17) bewegten Abschirmmittels (16) abgeschirmt ist, **dadurch gekennzeichnet, dass** das Abschirmmittel (16) durch die Steuerwelle (17) axial durch einen Abschirmselektor (15) bewegt wird, welcher gekoppelt und verbunden zu einem Steuerknopf (18) ist, welcher mit der Steuerwelle (17) derart verbunden ist, um die von dem Zerstäuber (14) kommende Strömung zu

- steuern;
wobei die Kopplung zwischen der Steuerwelle (17) und dem Abschirmselektor (15) durch eine Gewindekupplung erhalten ist.
2. Zerstäubungsvorrichtung nach Anspruch 1, wobei die Steuerwelle (17) mit einem Ende (32) eines schürzenförmigen Abschirmselektors (15), welcher die Abschirmmittel (16) umfasst, verbunden ist.
3. Zerstäubungsvorrichtung nach Anspruch 1 oder 2, wobei die Steuerwelle (17) sich entlang einer Mittelachse der oberen Komponente (2a) erstreckt.
4. Zerstäubungsvorrichtung nach einem der Ansprüche 1 bis 3, wobei das Abschirmmittel (16) aus zumindest zwei Schotten besteht, welche sich parallel zu einer Längserstreckung der Ampulle (2) an den Auswahlseitenfenstern (24) erstrecken.
5. Zerstäubungsvorrichtung nach einem der Ansprüche 1 bis 4, wobei der Abschirmselektor (15) weiter zwei zusätzliche Eintrittsfenster (27) für die Aufnahme von Luft innerhalb der Ampulle (2) umfasst.
6. Zerstäubungsvorrichtung nach einem der Ansprüche 1 bis 5, wobei der Steuerknopf (18), welcher an einem dem Abschirmselektor (15) gegenüberliegenden Ende (33) der Steuerwelle angeordnet ist, eine vertikale Position der Steuerwelle (17) mittels einer Rotations-Translations-Bewegung verändert.
7. Zerstäubungsvorrichtung nach einem der Ansprüche 1 bis 6, wobei der Steuerknopf (18) an einer äußeren Oberfläche (20) eine Nockennut (21) aufweist, welche mit entsprechenden Einraststiften (22) an einer inneren Oberfläche (23) der oberen Komponente (2a) verbindbar ist.
8. Zerstäubungsvorrichtung nach einem der Ansprüche 1 bis 7, weiter umfassend zumindest ein Ventilsystem (25) an einer Basis des Steuerkopfs (18) zu einer Strömungsveränderung des Luftstroms in der Einatmen- und Ausatmenphase.
9. Zerstäubungsvorrichtung nach einem der Ansprüche 1 bis 7, **gekennzeichnet durch** Bereitstellen eines virtuellen Ventilsystems (37), wobei das zumindest eine Eintrittsfenster (19) wolfsmaulförmig ist zum Anpassen des Luftstroms, welcher in die Ampulle (2) eintritt oder aus der Ampulle (2) austritt in der Einatmen- und Ausatmenphase.
10. Zerstäubungsvorrichtung nach einem der Ansprüche 1 bis 7, wobei der Abschirmselektor (15) einen nach oben ragenden Gewindeanteil (34) aufweist, welcher ein Innengewinde (35) aufweist, wobei das innere Gewinde (35) mit zumindest einem Außen-

gewinde (36) mit großem Radius an einer äußeren Oberfläche (38) der Steuerwelle (17) verbunden ist, um die Öffnung der Auswahlseitenfenster (24) abzuschirmen.

11. Zerstäubungsvorrichtung nach einem der Ansprüche 1 bis 9, weiter umfassend ein Kanalsegment (12) zum Koppeln mit einem Mundstück (13) an der mindestens einen Emissionsöffnung (11).
12. Zerstäubungsvorrichtung nach Anspruch 10, weiter umfassend Drehsicherungsflügel (40) für die Steuerwelle (17) innerhalb des Gewindeanteils (34).

Revendications

1. Dispositif de nébulisation (1) pour mélange médical, du type comprenant
- une ampoule formant contenant (2) pour ledit mélange médical, comprenant un composant supérieur (2a) et un composant inférieur (2b) reliés l'un à l'autre ;
- au moins une ouverture d'émission (11) dudit mélange médical nébulisé à partir de ladite ampoule (2), et
- au moins une fenêtre d'entrée (19) pour l'admission d'air à l'intérieur de ladite ampoule (2) ;
- au moins un atomiseur (14) pour l'admission de gaz sous pression, à l'intérieur dudit composant inférieur (2b) de ladite ampoule (2), ledit atomiseur (14) étant surmonté dudit composant supérieur (2a) ;
- au moins une, de préférence deux fenêtres latérales de sélection (24) sur ledit composant supérieur (2a), une ouverture desdites fenêtres latérales de sélection (24) étant masquée par des moyens de masquage (16), déplacés par un arbre de commande (17)
- caractérisé en ce que** lesdits moyens de masquage (16) sont axialement déplacés par ledit arbre de commande (17) par l'intermédiaire d'un sélecteur de masquage (15) couplé et lié à un bouton de contrôle (18) relié audit arbre de commande (17) de manière à commander le débit provenant de l'atomiseur (14) ; le couplage entre ledit arbre de commande (17) et ledit sélecteur de masquage (15) étant obtenu par un couplage fileté.
2. Dispositif de nébulisation, selon la revendication 1, dans lequel ledit arbre de commande (17) est relié à une extrémité (32) d'un sélecteur de masquage en forme de jupe (15) comprenant lesdits moyens de masquage (16).
3. Dispositif de nébulisation, selon la revendication 1

- ou 2, dans lequel ledit arbre de commande (17) s'étend le long d'un axe central dudit composant supérieur (2a).
4. Dispositif de nébulisation, selon l'une quelconque des revendications 1 à 3, dans lequel lesdits moyens de masquage (16) consistent en au moins deux cloisons étanches qui se développent parallèlement à un développement longitudinal de ladite ampoule (2), au niveau desdites fenêtres latérales de sélection (24). 5
5. Dispositif de nébulisation, selon l'une quelconque des revendications 1 à 4, dans lequel ledit sélecteur de masquage (15) comprend en outre deux fenêtres d'entrée supplémentaires (27) pour l'admission d'air à l'intérieur de ladite ampoule (2). 10 15
6. Dispositif de nébulisation, selon l'une quelconque des revendications 1 à 5, dans lequel ledit bouton de contrôle (18) placé à une extrémité (33) dudit arbre de commande opposée audit sélecteur de masquage (15), fait varier une position verticale dudit arbre de commande (17) par l'intermédiaire d'un mouvement de rotation-translation. 20 25
7. Dispositif de nébulisation, selon l'une quelconque des revendications 1 à 6, dans lequel ledit bouton de contrôle (18) fournit une rainure de came (21) au niveau d'une surface extérieure (20) de celui-ci, qui peut être couplée à des broches de prise correspondantes (22) au niveau d'une surface intérieure (23) dudit composant supérieur (2a). 30
8. Dispositif de nébulisation, selon l'une quelconque des revendications 1 à 7, comprenant en outre au moins un système de soupape (25) au niveau d'une base dudit bouton de contrôle (18) pour une variation de débit d'un débit d'air dans les phases d'inspiration et d'expiration. 35 40
9. Dispositif de nébulisation, selon l'une quelconque des revendications 1 à 7, **caractérisé par** la fourniture d'un système de soupape virtuel (37) dans lequel ladite au moins une fenêtre d'entrée (19) est en forme de gueule de loup pour ajuster le débit d'air entrant dans ladite ampoule (2), et sortant de celle-ci, dans les phases d'inspiration et d'expiration. 45
10. Dispositif de nébulisation, selon l'une quelconque des revendications 1 à 7, dans lequel ledit sélecteur de masquage (15) est muni d'une partie filetée (34) faisant saillie vers le haut, munie d'un filetage intérieur (35), ce filetage intérieur (35) étant mis en prise par au moins un filetage externe à large rayon (36) obtenu sur une surface externe (38) dudit arbre de commande (17), pour masquer l'ouverture desdites fenêtres latérales de sélection (24). 50 55
11. Dispositif de nébulisation, selon l'une quelconque des revendications 1 à 9, comprenant en outre un segment de conduit (12) pour le couplage à un embout buccal (13) au niveau de ladite au moins une ouverture d'émission (11).
12. Dispositif de nébulisation, selon la revendication 10, comprenant en outre des ailes de blocage par rotation (40) pour ledit arbre de commande (17) à l'intérieur de ladite partie filetée (34).

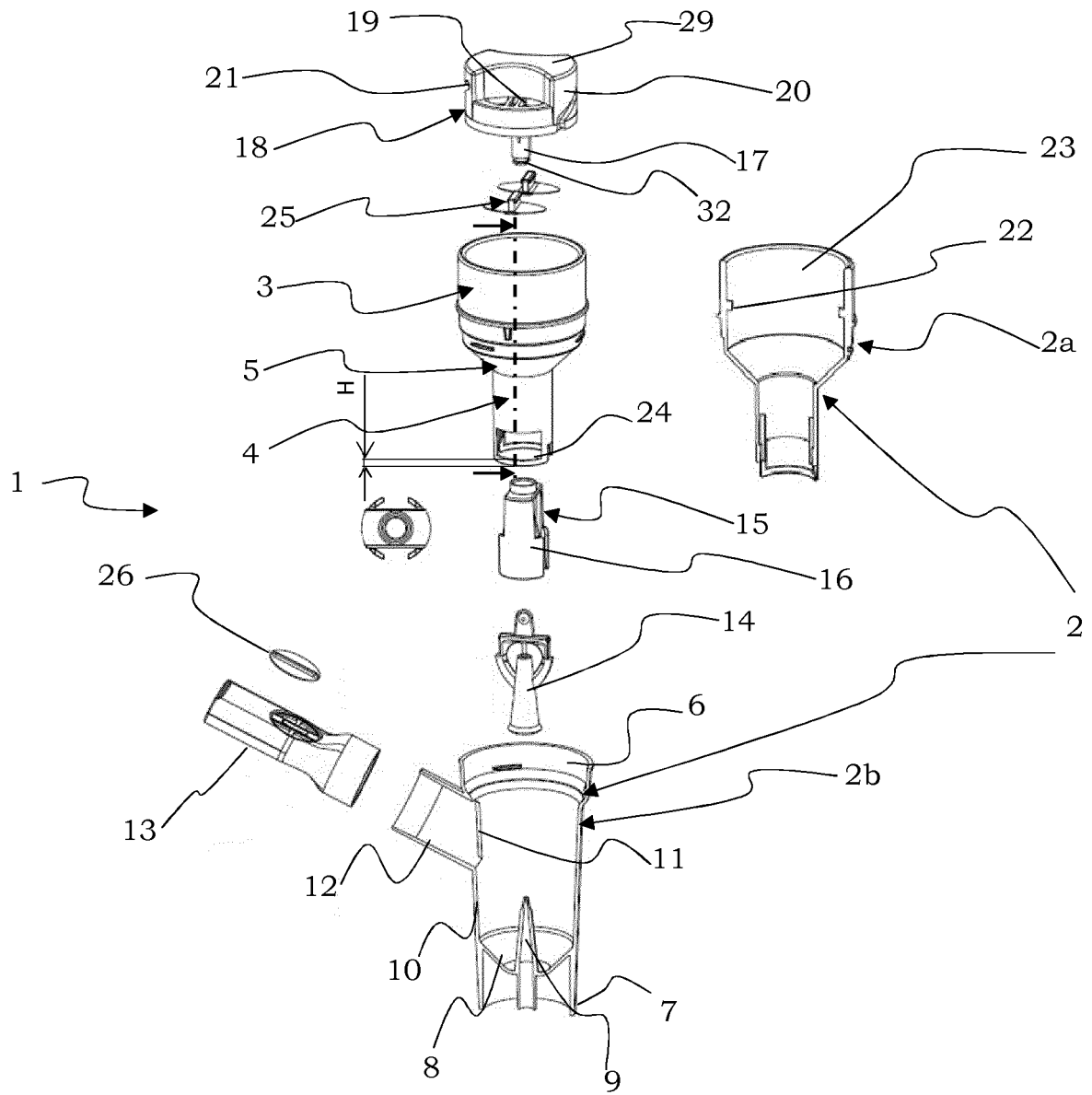


FIG. 1

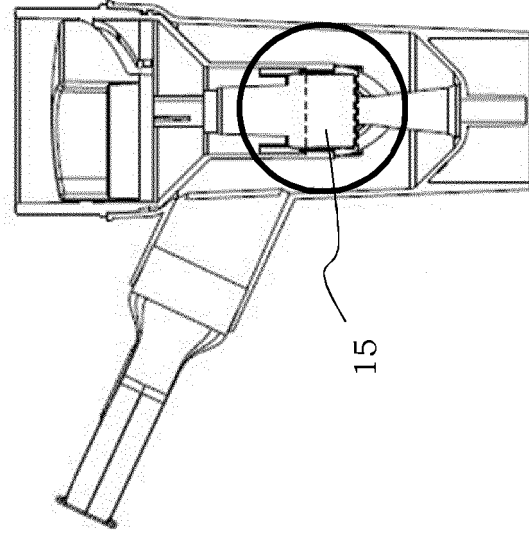


FIG. 2a
POSITION 1

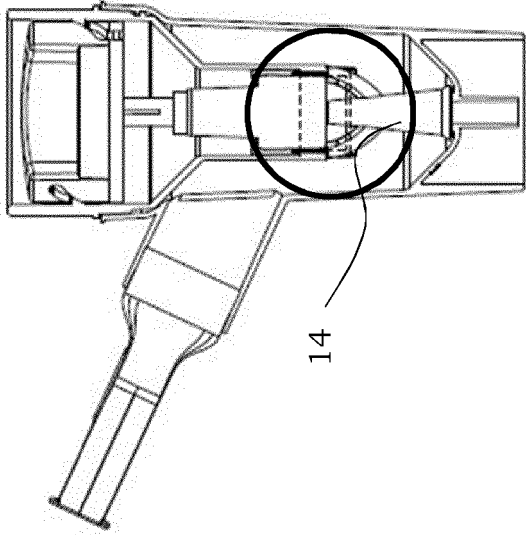


FIG. 2b
POSITION 2

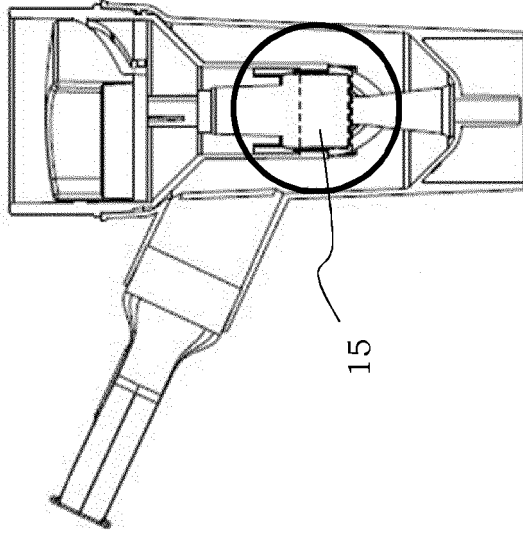


FIG. 2c
POSITION 3

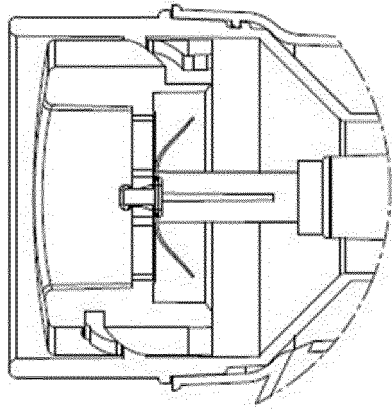


FIG. 3c

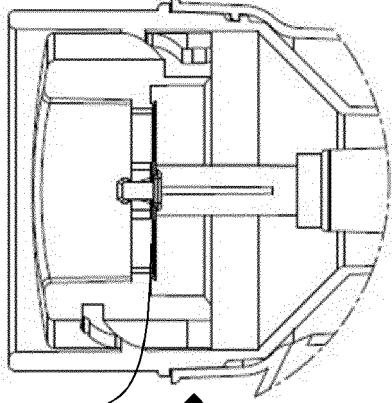


FIG. 3b

25

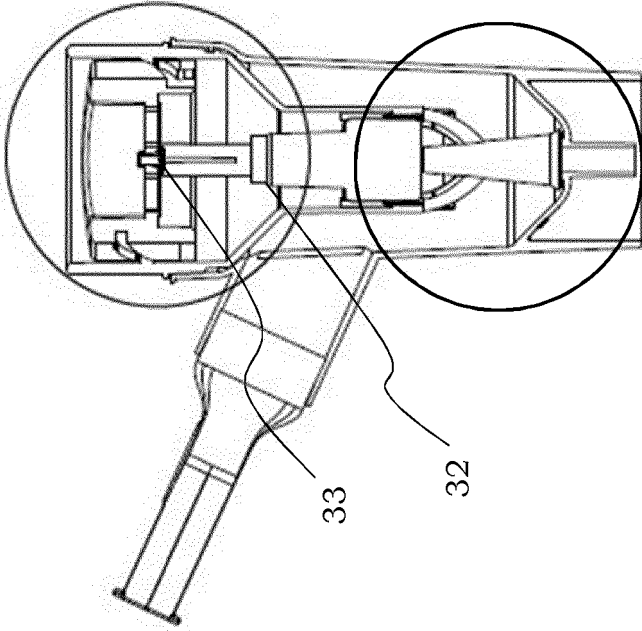


FIG. 3a

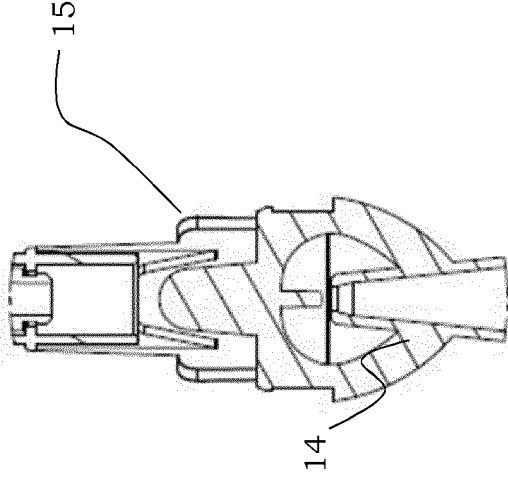


FIG. 3d

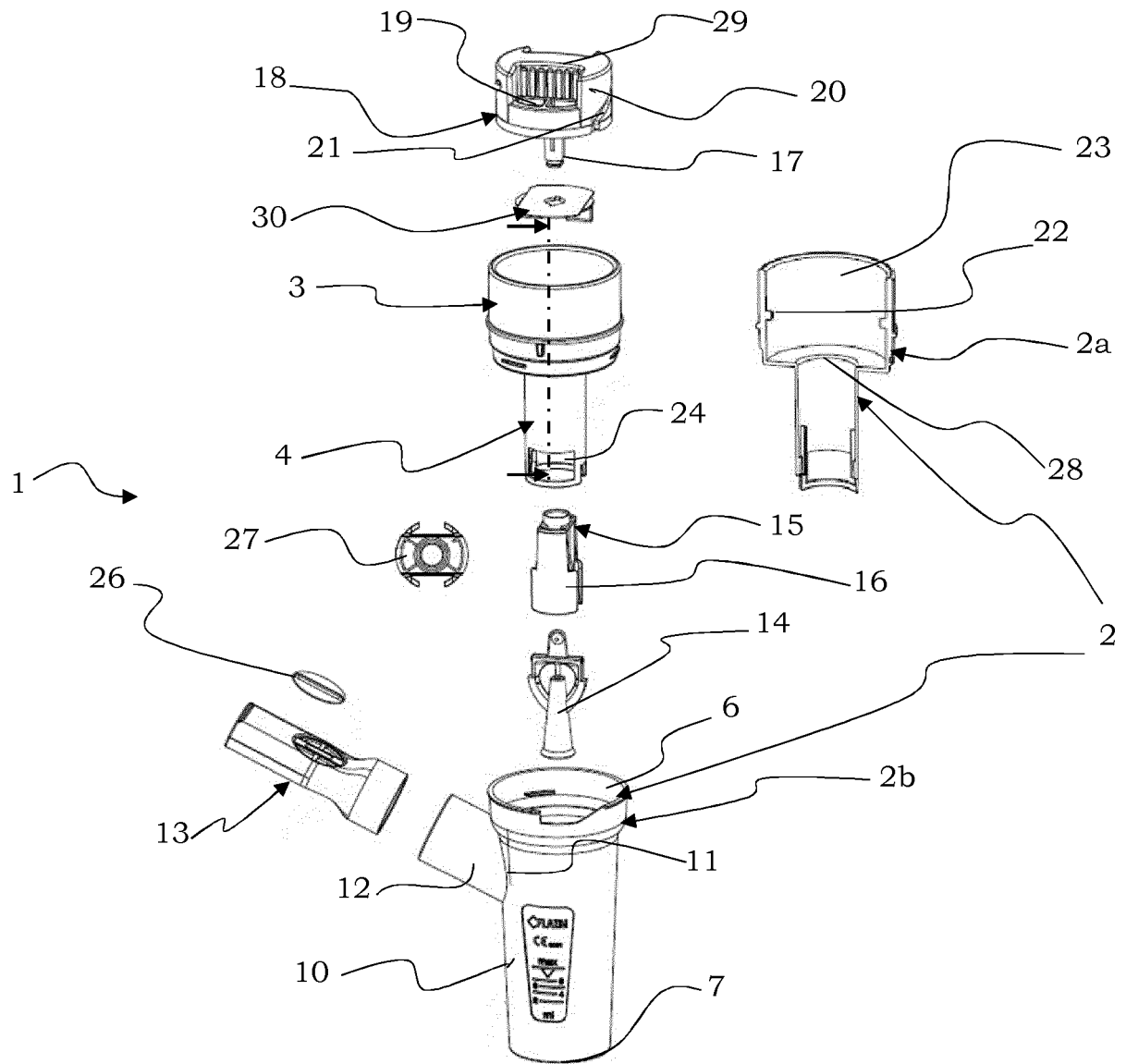


FIG. 4

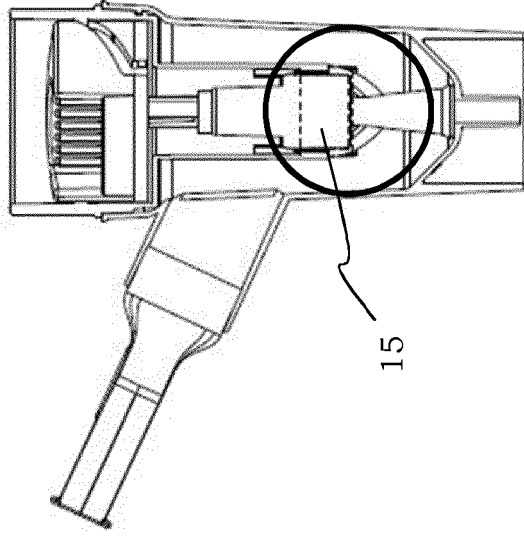


FIG. 5a
POSITION 1

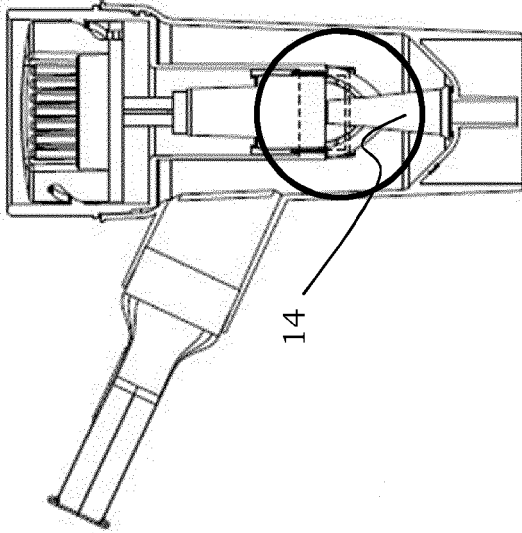


FIG. 5b
POSITION 2

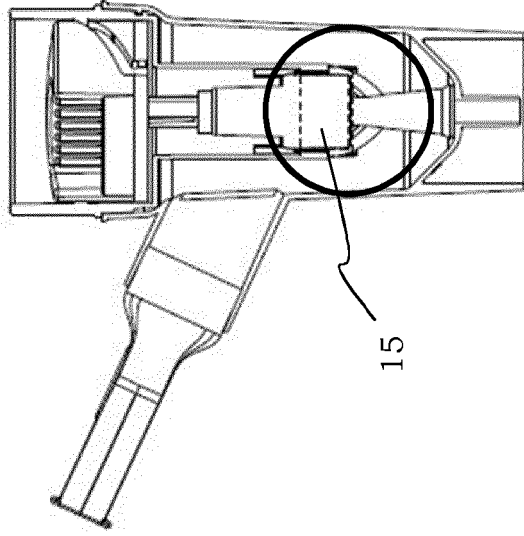


FIG. 5c
POSITION 3

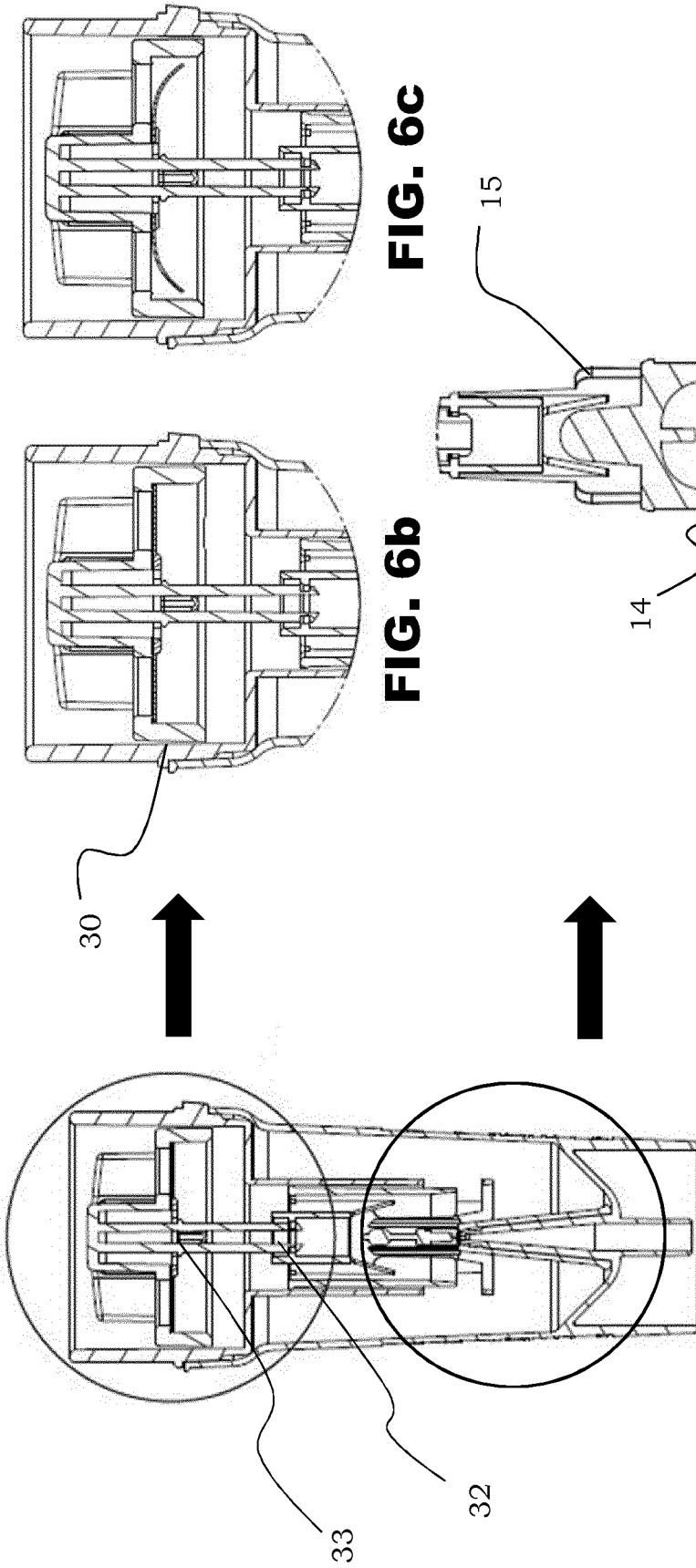


FIG. 6c

FIG. 6b

FIG. 6d

FIG. 6a

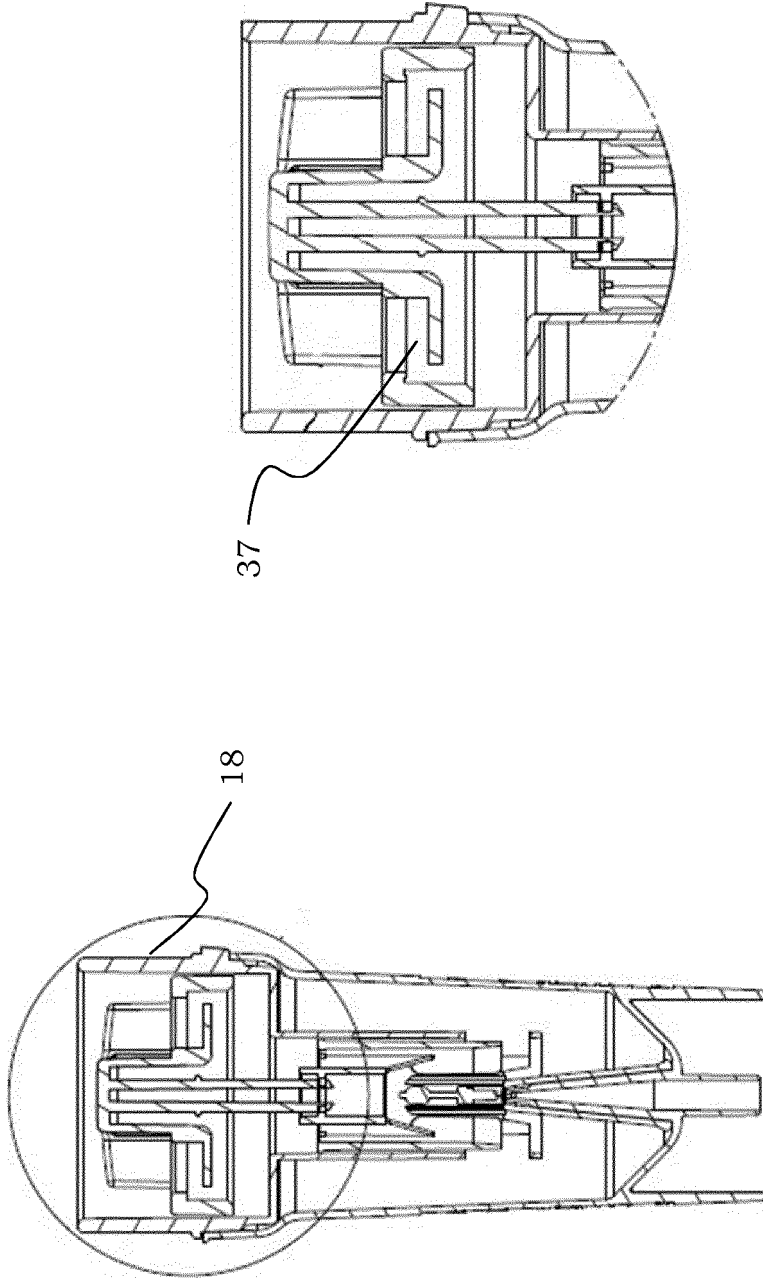


FIG. 7b

FIG. 7a

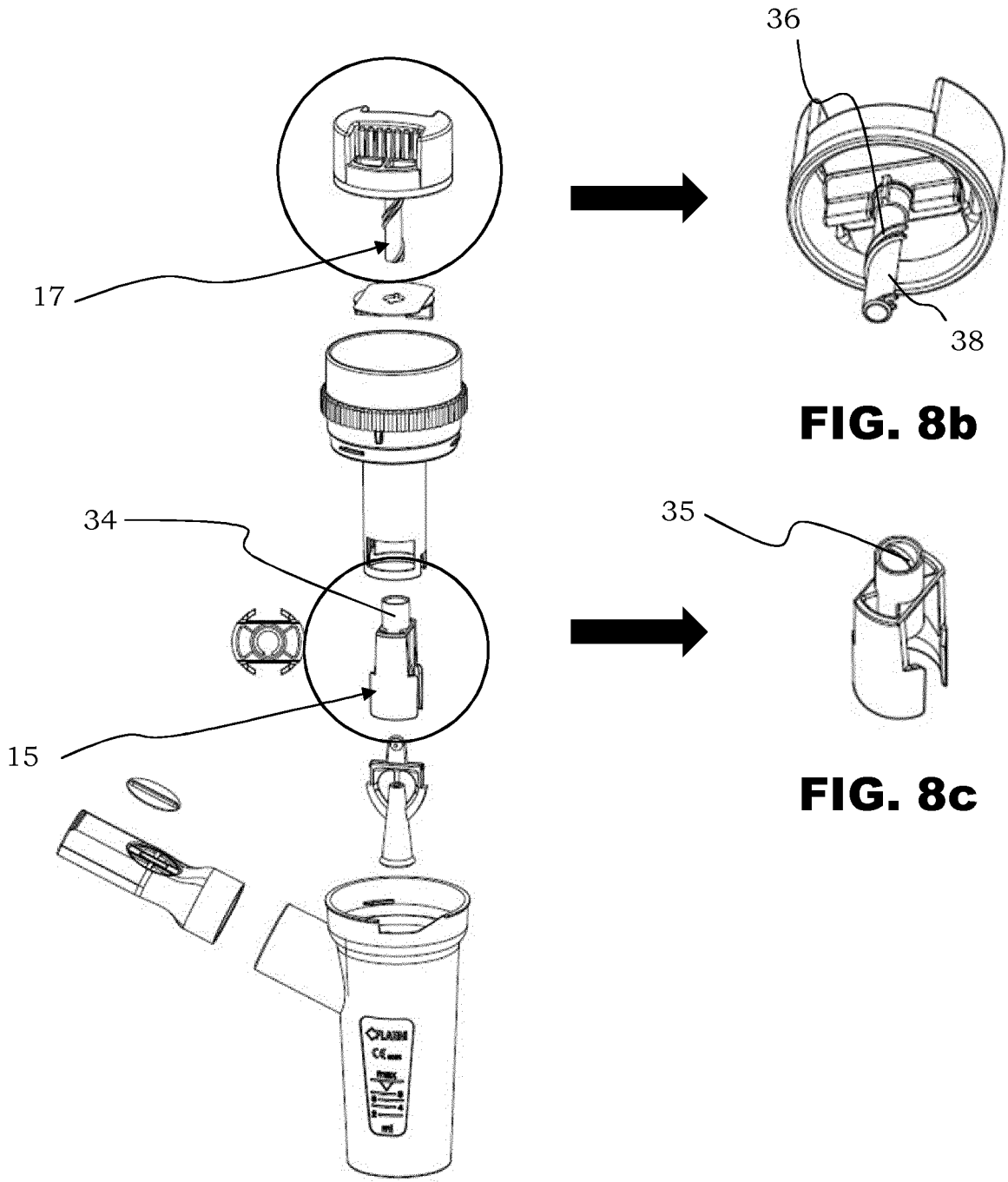


FIG. 8a

FIG. 8b

FIG. 8c

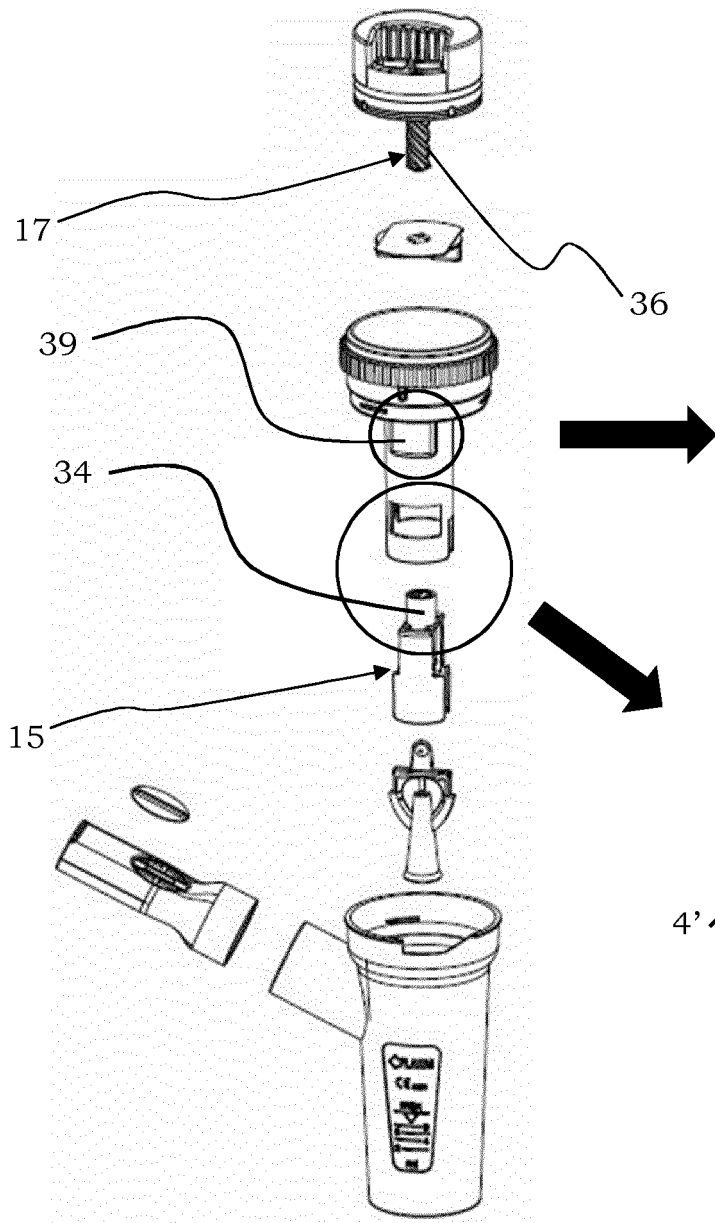


FIG. 9a

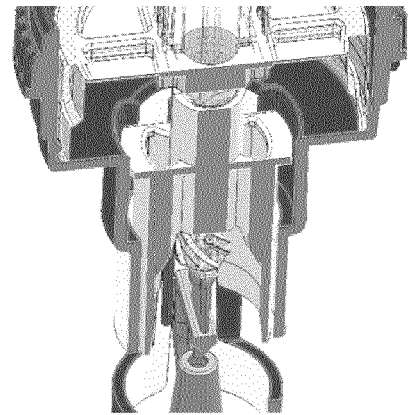


FIG. 9c

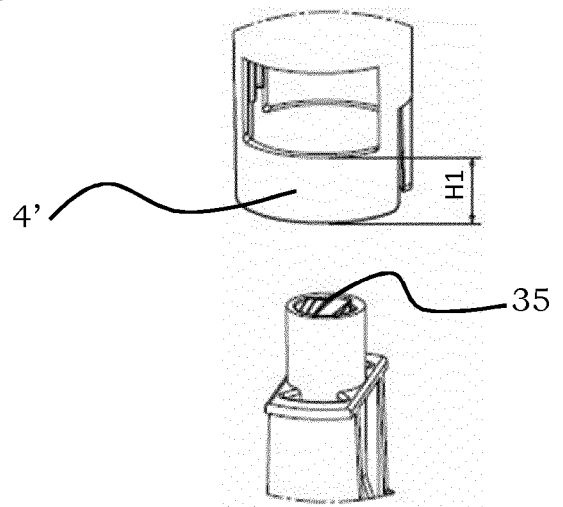


FIG. 9b

REFERENCES CITED IN THE DESCRIPTION

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